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## Taxonomy and geographical variation of *Satyrium ledereri* (BOISDUVAL, 1848) with the description of a new subspecies from the Greek island of Sámos (Lepidoptera : Lycaenidae)

Alain OLIVIER

**Samenvatting.** Taxonomie en geografische variatie van *Satyrium ledereri* (BOISDUVAL, 1848) met beschrijving van een nieuwe ondersoort van het Griekse eiland Sámos (Lepidoptera : Lycaenidae)

Het genus *Armenia* DUBATOLOV & KORSHUNOV, 1984 wordt in synonymie geplaatst onder *Satyrium* SCUDDER, 1876 en de nomenclatuur van de taxa *Satyrium ledereri* (BOISDUVAL, 1848) en *Satyrium hyrcanica* (RILEY, 1939), n. comb. wordt herzien. Daar er in de literatuur geen gedetailleerde beschrijving van *S. ledereri* bestaat, wordt dit taxon herbeschreven op basis van 3 exemplaren van Russisch Armeense afkomst. De geografische variabiliteit van deze soort in Turkije wordt besproken : alle tot nu toe bekende Turkse populaties behoren tot de nominaatvorm. De taxonomische status van de Libanese subspecies *Satyrium ledereri nazeri* (LARSEN, 1974), n. comb. wordt getoetst : 5 van de 8 door LARSEN aangehaalde subspécifieke kenmerken blijken binnen de variatiebreedte van *S. ledereri ledereri* te vallen, de 3 overige kenmerken alsook de hier aangehaalde lichtgrijze grondkleur van de onderkant maken dat deze entiteit niet wordt gesynonymiseerd.

Een geïsoleerde populatie op het Griekse eiland Sámos heeft een heel apart uiterlijk en vertoont konstante verschillen met de nominaatvorm; zij wordt hier beschreven als *Satyrium ledereri christiana* n.ssp. De geografische verspreiding en het biotoop van deze subspecies worden besproken en tenslotte volgen beschouwingen over de geografische geschiedenis van deze entiteit.

**Résumé.** Taxonomie et variation géographique de *Satyrium ledereri* (BOISDUVAL, 1848) avec description d'une nouvelle sous-espèce de l'île grecque de Sámos (Lepidoptera : Lycaenidae)

Le genre *Armenia* DUBATOLOV & KORSHUNOV, 1984 est placé en synonymie avec le genre *Satyrium* SCUDDER, 1876 et la nomenclature des taxa *Satyrium ledereri* (BOISDUVAL, 1848) et *Satyrium hyrcanica* (RILEY, 1939), n. comb. est révisée. Comme il n'existe pas de description détaillée de *S. ledereri* dans la littérature, ce taxon est redécrit sur base de 3 exemplaires d'origine arménienne russe. La variabilité géographique de cette espèce en Turquie est discutée : toutes les populations turques connues actuellement appartiennent à la forme nominale. Le statut taxonomique de la sous-espèce libanaise *Satyrium ledereri nazeri* (LARSEN, 1974), n. comb. est examiné : 5 des 8 caractères subspécifiques évoqués

par LARSEN s'inscrivent dans la marge de variation de *S. ledereri ledereri*, les 3 autres caractères ainsi que la couleur gris clair du dessous des ailes mentionnée ici justifient le maintien de cette entité qui n'est donc pas placée en synonymie.

Une population isolée se trouvant sur l'île grecque de Sámos a un habitus très distinct et présente des différences constantes par rapport à la sous-espèce nominale; elle est décrite ici comme *Satyrium ledereri christiana* n. ssp. La répartition géographique et le biotope de cette sous-espèce sont également décrits. Des considérations sur l'histoire géographique de cette entité terminent la présente étude.

**Key words :** *Satyrium* - *Armenia* - *ledereri* - *hyrcanica* - *nazeri* - *christiana* n. ssp. - geographic variation - Armenia - Turkey - Sámos - geographic history.

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### The generic classification of *Satyrium ledereri* (BOISDUVAL, 1848) and *S. hyrcanica* (RILEY, 1939)

Since its description, *Satyrium ledereri* (BOISDUVAL, 1848) has been placed in various generic combinations and a complete list of its successive taxonomic arrangements, together with that of the closely related *S. hyrcanica* (RILEY, 1939) is given in WEIDENHOFFER & ECKWEILER (1988), who erect the latter taxon to species rank, having found both taxa flying together. Recently a new genus *Armenia* has been created by DUBATOLOV & KORSHUNOV (1984) for *Satyrium ledereri*. The combination *Armenia ledereri* (BOISDUVAL, 1848) is also used by WEIDENHOFFER & ECKWEILER (l.c.).

The external characters, and especially the underside wingpattern of *S. ledereri* and *S. hyrcanica* are rather uncharacteristic of the genus *Satyrium* SCUDDER, 1876 and the two species together very probably form a monophyletic entity. However in my opinion, which is suggested by CLENCH (1979) who examined the male genitalia of *S. ledereri*, the genitalia of this species clearly show it to belong to the genus *Satyrium* (see also below). Admitting the existence of a separate genus including only *S. ledereri* and *S. hyrcanica*, as opposed to *Satyrium*, would lead us to rank them too high on the phylogenetic tree of the Theclini. Moreover, doing so, we would be forced to split up the genus *Satyrium* also in a number of other genera often grouping only very few or even just one species, obscuring the relationships supposed to exist between the diverse species(-groups). Therefore the following synonymy is stated :

*Satyrium* SCUDDER, 1876, Bull. Buffalo Soc. Nat. Sci. 3 : 106, type species by original designation, *Lycaena fuliginosa* EDWARDS, 1861

= *Armenia* DUBATOLOV & KORSHUNOV, 1984, Chlenistonogie i gel'minty, Sibir. Otdel. Ak. Nauk USSR, Novosibirsk : 51-57, type species by original designation, *Lycaena ledereri* BOISDUVAL, 1848, n. syn.

Consequently the nomenclature of the taxa ascribed to the genus *Armenia* by WEIDENHOFFER & ECKWEILER (l.c.) is now considered to be as follows (all data checked) :

1. *Satyrium ledereri* (BOISDUVAL, 1848) in CLENCH 1979, **rev. comb.**

- = *Lycaena ledereri* BOISDUVAL in BOISDUVAL 1848
- = *Argus ledereri* BOISDUVAL in GERHARD 1853
- = *Thecla ledereri* BOISDUVAL in STAUDINGER 1879
- = *Bakeria ledereri* BOISDUVAL in TUTT 1907
- = *Thecla ledereri* BOISDUVAL in SEITZ 1909
- = *Bakeria ledereri* BOISDUVAL in PFEIFFER 1931-1932
- = *Bakeria ledereri* BOISDUVAL in HIGGINS 1966
- = *Pseudothecla ledereri* BOISDUVAL in KORSHUNOV 1972
- = *Fixsenia ledereri* BOISDUVAL in LARSEN 1974a
- = *Fixsenia ledereri* BOISDUVAL in LARSEN 1974b
- = *Armenia ledereri* BOISDUVAL in DUBATOLOV & KORSHUNOV 1984
- = *Armenia ledereri* BOISDUVAL in WEIDENHOFFER & ECKWEILER 1988

1a. *S. ledereri ledereri* (BOISDUVAL, 1848)

1b. *S. ledereri nazeri* (LARSEN, 1974), **n. comb.**

- = *Fixsenia ledereri nazeri* LARSEN in LARSEN 1974a
- = *Fixsenia ledereri nazeri* LARSEN in LARSEN 1974b
- = *Armenia ledereri nazeri* LARSEN in WEIDENHOFFER & ECKWEILER 1988

2. *Satyrium hyrcanica* (RILEY, 1939), **n. comb.**

- = *Strymon ledereri hyrcanica* RILEY in RILEY 1939
- = *Fixsenia ledereri* BOISDUVAL in SAKAI 1978
- = *Fixsenia hyrcanica* RILEY in ECKWEILER & HOFMANN 1980
- = *Fixsenia ledereri* BOISDUVAL in SAKAI, 1981
- = *Pseudothecla cyri* NEKRUTENKO in NEKRUTENKO, KORSHUNOV & EFFENDI 1982
- = *Armenia hyrcanica* RILEY in WEIDENHOFFER & ECKWEILER 1988

2a. *S. hyrcanica hyrcanica* (RILEY, 1939), **n. comb.**

- = *Strymon ledereri hyrcanica* RILEY in RILEY 1939
- = *Fixsenia hyrcanica hyrcanica* RILEY in ECKWEILER & HOFMANN 1980
- = *Armenia hyrcanica hyrcanica* RILEY in WEIDENHOFFER & ECKWEILER 1988

2b. *S. hyrcanica cyri* (NEKRUTENKO, 1978), **n. comb.**

- = *Pseudothecla ledereri cyri* NEKRUTENKO in NEKRUTENKO 1978
- = *Pseudothecla cyri cyri* NEKRUTENKO in NEKRUTENKO, KORSHUNOV & EFFENDI 1982
- = *Armenia hyrcanica cyri* NEKRUTENKO in WEIDENHOFFER & ECKWEILER 1988

2c. *S. hyrcanica badachshanica* (STSHETKIN, 1984), **n. comb.**

- = *Pseudothecla cyri badachshanica* STSHETKIN in STSHETKIN 1984
- = *Armenia hyrcanica badachshanica* STSHETKIN in WEIDENHOFFER & ECKWEILER 1988

2d. *S. hyrcanica seravshanica* (STSHETKIN, 1984), **n. comb.**

- = *Pseudothecla cyri seravshanica* STSHETKIN in STSHETKIN 1984
- = *Armenia hyrcanica seravshanica* STSHETKIN in WEIDENHOFFER & ECKWEILER 1988

**Material examined of *S. ledereri* from Asia Minor**

I was able to examine 65 specimens of this species that were deposited in the collection of the Instituut voor Taxonomische Zoölogie (Zoölogisch Museum) Amsterdam (ITZ) and in the private collections of Dr. P. S. WAGENER (Bocholt, Westf., B.R.D.) and Mr. G. HESSELBARTH (Diepholz, B.R.D.).

One specimen in coll. ITZ only bears an old handwritten label with the following inscription: «Ost Armen. 1887» [East Armenia, U.S.S.R.] and two other unlabelled specimens deposited in the same collection have a similar

general facies as that specimen and have been prepared in a similar way : all three of them probably share the same origin. The other 62 specimens have all been collected within the political boundaries of Turkey in the period from 1971 to 1988.

A full list of the material examined is given here and the localities are plotted on map 1. An exhaustive list of all known localities of *S. ledereri ledereri* in Turkey will be published in the forthcoming monography on the butterflies of Turkey by HESSELBARTH, VAN OORSCHOT & WAGENER.

- Armenia (U.S.S.R.) : Ost Armen. 1887 [E. Armenia], coll. ITZ, 1 ♂; unlabelled specimens, probably of the same origin, 2 ♂.
- Prov. Hakkari : 45 km NE. Hakkari, 5-6 km on rd. Yüksekova (1800 m), st. 258, 17.VI.1985, leg. H. VAN OORSCHOT & H. VAN DEN BRINK, coll. ITZ, 1 ♂; Beytüşşebap (1320 m), loc. 62, 4.VI.1985, leg. et coll. S. WAGENER, 2 ♂.
- Prov. Van : 16 km NE. Çatak (2200-2500 m), st. 499, 6-7.VIII.1988, leg. B. VAN OORSCHOT, W.O. DE PRINS & A. RIEMIS, coll. ITZ, 1 ♂.
- Prov. Urfa : 20 km N. Urfa (700-800 m), st. 167, 31.VI.1984, leg. H. VAN OORSCHOT & H. VAN DEN BRINK, coll. ITZ, 18 ♂.
- Prov. Gaziantep : Kartal Dağı, S. Büyükaraplar, TV-Station (1300 m), 25.VI.1983, leg. et coll. G. HESSELBARTH, 2 ♂, idem, 27.VI.1983, 7 ♂, 2 ♀; idem, 28.VI.1983, 1 ♀; 20 km W. Gaziantep (1000 m), st. 158, 30.V.1984, leg. H. VAN OORSCHOT & H. VAN DEN BRINK, coll. ITZ, 1 ♀.
- Prov. Malatya : 32-35 km NE. Gölbaşı (1200-1400 m), st. 217, 30.V.1985, leg. H. VAN OORSCHOT & H. VAN DEN BRINK, coll. ITZ, 3 ♂; 3-4 km N. Darende (1200 m), 3.VII.1983, leg. et coll. G. HESSELBARTH, 1 ♀; Gürün-Darende (1500 m), 6.VII.1980, leg. et coll. G. HESSELBARTH, 1 ♀.
- Prov. Gümüşhane : Çimen dagl., N. Yenyol (1700-1800 m), 21.VII.1978, leg. et coll. G. HESSELBARTH, 1 ♀.
- Prov. Erzincan : 5 km N. Yalvizbag (1450 m), st. 464, 9-13.VI.1988, leg. H. & Th. VAN OORSCHOT, H. VAN DEN BRINK & H. WIERING, coll. ITZ, 1 ♀; 8 km N. Erzincan, Rd. Erzincan-Cayirli (1750 m), st. 465, 10.VI.1988, leg. H. & Th. VAN OORSCHOT, H. VAN DEN BRINK & H. WIERING, coll. ITZ, 1 ♂.
- Prov. Sivas : Gökpınar S. Gürün (1500 m), 9.VII.1982, leg. et coll. G. HESSELBARTH, 1 ♀; idem, 14.VII.1982, 1 ♂; idem, 2.VII.1983, 1 ♂; Env. Gökpınar, 10 km S. Gürün (1500-1700 m), st. 91, 15-29.VI.1983, leg. B. VAN OORCHOT, coll. ITZ, 4 ♂, 2 ♀.
- Prov. Corum : vic. Boğazkale (ca. 1200 m), 5.VII.1976, leg. et coll. G. HESSELBARTH, 1 ♂, 1 ♀.
- Prov. Ankara : vic. Kizilcahaman (ca. 1000 m), 7.VI.1971, leg. et coll. G. HESSELBARTH, 1 ♂.
- Prov. Niğde : Ulukışla Pass (1400 m), 25.VI.1977, leg. et coll. G. HESSELBARTH, 1 ♂.
- Prov. Konya : Hills SE. Ivriz, 20 km SE. Ereğli (1500-2100 m), st. 272, 22-23.VII.1985, leg. B. VAN OORSCHOT & W.O. DE PRINS, coll. ITZ, 2 ♂.
- Prov. Antalya : Irmesan Geçidi, 12 km N. Akseki (1500-1900 m), 24-27.VII.1981, leg. H. COENE, J. LUCAS & B. VAN OORSCHOT, coll. ITZ, 1 ♂, 1 ♀; Geyik Dagh, 30 km NE. Gündoğmus (2000 m), 23.VII.1978, leg. B. VAN OORSCHOT; coll. ITZ, 1 ♀; Gündoğmus, 26.VII.1977, leg. B. VAN OORSCHOT, coll. ITZ, 1 ♀.

### Redescription of *Satyrrium ledereri ledereri* (BOISDUVAL, 1848)

Rather surprisingly there doesn't seem to exist any detailed description of *S. ledereri ledereri* (BOISDUVAL, 1848) in literature. BOISDUVAL described this taxon from specimens originating from the foothills of the Caucasus. The 3 available specimens originating from Russian Armenia are considered to be representative of this taxon and the following redescription is based on these specimens (see also figs. 1 and 3).



Map 1 - Localities from where material of *S. ledereri* was examined for the present study (East Armenia not included)

### A) External characters

**Male.** Forewing length (from base to the apex, without fringes) 16,0 mm; 16,6 mm; 16,8 mm; average : 16,47 mm.

**Upperside forewing** groundcolour brown, basal area lighter brown, with small dark brown discoidal spot; no androconial spot; outer margin more or less regularly convex, hooking inwards from v5 to the apex; fringes brown basally, white distally.

**Upperside hindwing** groundcolour as on upperside forewing, basal half lighter brown, as on forewing, with 2 small dark brown discoidal spots; submarginal lunules in anal lobe in s1-s3 clearly marked, orange, contiguous or fused into a band sometimes distally bordered by dark brown scales, darker than groundcolour; fringes as on forewing upperside; prominent brown tail at v2 with a white tip and white scales on side of anal lobe, as a continuation of the fringes (latter feature not in specimen illustrated on fig. 1, that probably lost some scales).

**Underside forewing** groundcolour warm light greyish brown, with 2 white-ringed blackish brown discoidal spots and a complete row of 7(8) blackish brown postdiscal spots, distally bordered white, doubled by a submarginal row of 6 spots; the 2 postdiscal and 2 submarginal spots in s1a-s1b being in fact single spots split up by v1; vestigial blue basal suffusion; fringes brown basally (darker than groundcolour, same colour as on upperside, forming a marginal stripe), white distally.

**Underside hindwing** groundcolour as on underside forewing, with 2 white-ringed blackish brown to black discoidal spots and a complete row of 7 white-ringed blackish brown to black postdiscal spots in s1b-s5, the white scales conspicuously extending distally; 2 additional such spots in s6-s7 displaced basally as compared to the postdiscal series and lying parallel to the discoidal

spots; blue basal suffusion better developed than on forewing and extending somewhat along the inner margin; 7 orange submarginal lunules in s1b-s6, sometimes a vestigial one in s7, all bordered blackish brown or black basally and distally; small white border along outer margin and white scales along black basal border of submarginal lunules; fringes as on underside forewing.

**Antennae** brown, white-ringed; antennal club uniformly brown.

**Palpi** above white basally, blackish brown distally, white tip; underside entirely white.

**Female.** No Armenian material available. Turkish material of *S. ledereri* suggests only a negligible sexual dimorphism: female slightly larger than male, upperside hindwing with even more developed orange submarginal lunules often forming a band (figs. 2 and 6).

## B) Genitalia

For the naming of the various structures of the male and female genitalia I follow KLOTS (1970) and HIGGINS (1975). The description of the male genitalia is based on the labelled Russian Armenian specimen also illustrated on figs. 1 and 3. As no female specimen was available from there the description of the female genitalia is based on 2 Turkish specimens (Prov. Sivas and Antalya).

**Male.** - Genitalia very similar to those of *Satyrium ilicis* (ESPER, 1779), *S. esculi* (HÜBNER, [1804]), *S. acaciae* (FABRICIUS, 1787), *S. spini* (DENIS & SCHIFFERMÜLLER, 1775) and *S. w-album* (KNOCH, 1782), clearly showing the position of *S. ledereri* among the genus *Satyrium* SCUDDER, 1876 (compare figures in present work to figs. 129 and 133 in HIGGINS 1975: 109-112 and to NEKRUTENKO 1985: 108-111) : short and wide, about 1,3 times as long as wide, thus resembling *S. acaciae*; valves small and narrow, much like those of *S. w-album*, distally divergent, terminal section very slender; labides not very close together; falces oblique, curved and moderately long, much like *S. w-album*; penis slender, distally with 2 sclerotized terminal cornuti of about equal length and a third sclerotized ventral terminal cornutus (the «ventral serrated keel» of CLENCH 1979), resembling in this respect *S. ilicis*, *S. acaciae*, *S. spini* and *S. w-album* (fig. 13).

**Female.** - Genitalia very similar to those of *S. spini*, *S. w-album* and *S. acaciae*, as illustrated in NEKRUTENKO (l.c.): 108-111 (but drawn in ventral projection and not laterally as in NEKRUTENKO l.c.) : papillae anales moderately long, slender; apophyses posteriores filiform, about 1,8 times as long as papillae anales; ductus bursae moderately long, wide, broadening distally and there as broad as the corpus bursae (cervix bursae); corpus bursae about as long as ductus bursae and cervix bursae together, no appendix bursae; two short sclerotized signae (figs. 19 and 20).

For comparison purposes the male and female genitalia of *S. hyrcanica cyri* (NEKRUTENKO, 1978) are shown here (figs. 14 and 22, see also NEKRUTENKO 1978). They are identical to those of *S. ledereri ledereri*.

### Geographical variation of *S. ledereri ledereri* in Turkey

Examination of the available Turkish material mentioned above suggests some minor geographical variation between populations from several provinces as compared to each other and to Russian Armenian material. However, none of these differential characters appear to be constant. Therefore all Turkish populations that are known can be ascribed to *S. ledereri ledereri*.

Most Turkish specimens are smaller than the 3 available males of Russian Armenian origin, their groundcolour often being darker, becoming dark brown especially in material from Prov. Hakkari, Van, Malatya, Erzincan and Sivas, making the dark brown discoidal spots hardly visible or even absent (figs. 5 and 6). The orange submarginal lunules on upperside hindwing are variably expressed; they are always well-developed in specimens from Prov. Hakkari, Urfa, Malatya (fig. 5), Gümüşhane, Ankara, Niğde and Antalya (fig. 2) and mostly so in specimens from Prov. Gaziantep and Sivas (fig. 6); they are less developed in specimens from Prov. Corum and Konya; when the orange lunules are vestigial or absent the distal dark brown scales are always present. The tails at v2 on hindwing are well-developed in all available specimens from Prov. Hakkari, Van, Gümüşhane, Erzincan, Corum, Niğde and Konya and in all specimens but one (tailless) from the samples from Prov. Malatya (fig. 5) and Sivas (fig. 6). Tails are, to the contrary, entirely absent in all available specimens from Prov. Gaziantep, Ankara and Antalya (figs. 2 and 4) and in 16 out of the 18 specimens from prov. Urfa.

The ground colour of the underside is quite variable: light brownish grey in specimens from Prov. Urfa, but usually of a darker, colder and more greyish brown than in the Russian Armenian specimens. Mostly there is a reduction in number of the submarginal spots on underside forewing, usually only 3 to 5: all spots on the underside are black instead of blackish brown. The blue basal suffusion is usually vestigial or even totally absent. The submarginal lunules in s1b-s6 (s7) are usually orange-red or bright orange (Prov. Hakkari, Malatya, Erzincan, Sivas, Ankara, Antalya) (fig. 4) to light orange-yellow (Prov. Gaziantep and Gümüşhane).

The genitalia are as in Russian Armenian *S. ledereri ledereri* and *S. hyrcanica cyri*: terminal section of valve broader in male specimen from Prov. Antalya (figs. 15 and 16).

### The status of *Satyrium ledereri nazeri* (LARSEN, 1974)

*Satyrium ledereri nazeri* (LARSEN, 1974) was described from specimens collected on the Jabal Kesrouan (1600 m) and on the Cedar Mountain (2200 m) in the Lebanon. Unfortunately I have not been able to examine any specimen of this subspecies. The paper containing the original description (LARSEN 1974a) gives only a poor photograph and therefore we must use the text of the original description and the good photographs on plate 144 in LARSEN (1974b). The study of Turkish material has revealed that at least 5 out

of the 8 characters used by LARSEN to separate *nazeri* from nominotypical *ledereri* are irrelevant as they also fall within the normal range of variation of Turkish *ledereri* :

- the size (forewing length 15-16 mm in *nazeri*) is quite normal : for the examined Turkish material I found values between 12,9 and 16,0 mm.
- submarginal spots on underside forewing (2-4 in *nazeri*) : Turkish specimens have between 3 and 6 such spots, 3-4 spots being the commonest condition.
- 2 discoidal spots on underside lacking or vestigial, especially on forewings : in one single specimen from Prov. Malatya the discoidal spots on underside forewing are lacking; often there is just one discoidal spot (the upper one) on underside forewing in specimens from e.g. Prov. Urfa, but all Asiatic specimens examined by me have 2 discoidal spots on underside hindwing.
- orange submarginal lunules on underside hindwing smaller than in nominotypical *ledereri* : I found as small lunules at least in material from Prov. Urfa and Gaziantep.
- nazeri* has no tails at v2 on the hindwings : the presence or absence of tails is a variable feature, there being entire Turkish populations with or without tails or presenting both conditions (see also discussion above).

There remain 3 characters mentioned by LARSEN that allow us to maintain *S. ledereri nazeri* as a valid subspecies on present evidence :

- the reduction of the number of postdiscal spots on underside forewing (4-5 instead of 6-7 in *S. ledereri ledereri*).
- total number of black spots (including the 2 discoidal spots) on underside hindwing 7-9 instead of 11 in *S. ledereri ledereri*).
- blue basal suffusion more extensive than in *S. ledereri ledereri*.

One possible additional character, as far as we can judge from the photograph in LARSEN (1974b) is the groundcolour of the underside of the wings being light grey, much lighter than in any specimen examined by me. None of these showed fulvous markings on upperside forewing like the female paratype of *S. ledereri nazeri* shown on plate 144 in LARSEN (l.c.).

### A new subspecies of *Satyrium ledereri* from the Greek island of Sámos

During one of my visits to the Greek islands I came across a colony of *Satyrium ledereri* on one of the mountains of the island of Sámos, some 450 km to the west of the westernmost known Turkish population (Irmesan Geçidi, Prov. Antalya). 50 specimens were collected : this material differs clearly and constantly from all studied Turkish (and Russian Armenian) material and is described here as a new subspecies (see also figs. 7-12) :

#### *Satyrium ledereri christiana* n. ssp.

#### A) External characters

**Male.** - Forewing length (from base to the apex, without fringes) : 13,0-15,1 mm; average of 42 specimens : 14,14 mm.

**Upperside forewing groundcolour** dark brownish grey, darker and much greyer than in any other known population of *S. ledereri*, with a faint lilac gloss



all over the wing; no discoidal spot nor androconial spot; basal area only slightly paler; outer margin straight or only slightly convex, hooking distinctly inwards only from v6 to apex, giving the forewing a more elongated and pointed appearance, thus differing from most Turkish and all Russian Armenian specimens; fringes dark brownish grey basally, white distally.

**Upperside hindwing groundcolour** as on upperside forewing, also with a faint lilac gloss all over the wing; no discoidal spot; basal area only slightly paler; submarginal lunules in anal lobe in s1-s3 completely absent or only very weak traces of them (fig. 7), only 4 specimens (9,5%) showing a little development of these lunules, which are of a paler beige-orange colour instead of orange in *S. ledereri ledereri* (fig. 11); never a tail at v2; fringes dark brownish grey basally, white distally.

**Underside forewing groundcolour** a cold brownish grey, much darker and much greyer than in any other examined population of *S. ledereri*; upper discoidal spot always better developed than the other one; always 4 submarginal spots (3 in one single specimen), sometimes very faint; all spots black, position and bordering with white scales as in *S. ledereri ledereri*, green-blue basal suffusion negligible; fringes as in *S. ledereri ledereri*, but basally of a dark brownish grey colour (darker than groundcolour, same colour as upperside, forming a marginal stripe), white distally.

**Underside hindwing groundcolour** as on underside forewing; spots always black, for the rest the spotting pattern is as in *S. ledereri ledereri* (fig. 9), one additional postdiscal spot in s1 in one single specimen (fig. 12); green-blue basal suffusion usually better developed than in *S. ledereri ledereri*, extending along the inner margin; submarginal lunules positioned as in *S. ledereri ledereri*, but colour pale yellow (usually) to bright sulfur yellow (in some specimens); fringes as on underside forewing.

**Antennae** dark brownish grey, white-ringed; antennal club uniformly dark brownish grey.

**Palpi** above white basally, blackish grey distally, white tip; underside entirely white.

**Female.** - Slightly larger than male; forewing length (from the base to the apex (without fringes) : 14,0-15,5 mm; average of 8 specimens : 14,94 mm; outer margin of forewings slightly more convex than in male; submarginal lunules on upperside hindwing better developed than in male : only traces in 2 specimens, better visible in 6 specimens and of a beige-orange colour; in all other features identical to the male (figs. 8 and 10).

**Variation in both sexes** : individual variation is slight, only affecting somewhat the extension of the submarginal lunules on upperside hindwing and the intensity of the yellow colour of the submarginal lunules on underside hindwing.

**Note.** One single female *S. ledereri ledereri* from Prov. Erzincan (Turkey) has exactly the same groundcolour as *S. ledereri christiana*e on the upperside and underside of the wings; however on the upperside the characteristic faint lilac gloss, typical for *christiana*e, is lacking, it has a clearly convex outer

margin of the forewings and the submarginal lunules on underside hindwings are bright orange-red.

## B) Genitalia

The male and female genitalia of *S. ledereri christianae* are identical to those of *S. ledereri ledereri* and *S. hyrcanica cyri* (figs. 17, 18 and 21; see also fig. 16 for comparison).

## C) Types

Holotype male (figs. 7 and 9) : «Mt. Karvoúni (Sámos, Griekenland) (1150 m)/11.VI.1988/leg. Alain OLIVIER» (Mt. Karvoúni, Sámos, Greece, 1150 m, 11 June 1988, leg. Alain OLIVIER), deposited in the Instituut voor Taxonomische Zoölogie (Zoölogisch Museum) Amsterdam.

Paratypes : 41 males, 8 females; all same locality as holotype, but collected on 11 and 13.VI.1988, deposited in the following collections : 9 ♂, 2 ♀ in coll. Instituut voor Taxonomische Zoölogie (Zoölogisch Museum) Amsterdam; 19 ♂, 6 ♀ in coll. A. OLIVIER (Antwerpen); single males in coll. W.O. DE PRINS (Antwerpen), D. VAN DER POORTEN (Antwerpen), J. DILS (Hoevenen, Belgium), F. COENEN (Brussels), J. HUISENGA (Amsterdam), T. GARREVOET (Antwerpen), J.G. COUTSIS (Athens), G. HESSELBARTH (Diepholz, B.R.D.), Dr. P. S. WAGENER (Bocholt, Westf., B.R.D.), Vlaamse Vereniging voor Entomologie (V.V.E.) (Antwerpen), Koninklijk Belgisch Instituut voor Natuurwetenschappen (K.B.I.N.) (Brussels), Rijksmuseum van Natuurlijke Historie Leiden (R.M.N.H.), British Museum (Natural History) (London).

## D) Derivation of the name

I name this new subspecies after my wife Christiane, to whom this paper is also dedicated.

## E) Distribution and habitat

Only known from Mt. Karvoúni (Ámbelos Óri) (1150 m) on the island of Sámos (Greece), facing the Turkish province of Aydin. It was collected on 11 and 13 June 1988. Most specimens were very fresh.

The biotope is a windswept rocky treeless mountain top with stands of a white-flowered leguminose (*Astragalus* sp. ?) that was often inspected by specimens of *S. ledereri christianae* and that could be its foodplant. Most specimens, however, were observed while sitting on very small purple-flowered plants growing only less than 5 cm above the ground, from which they were sipping nectar. All specimens were observed in an area of only about 50 m x 20 m. No specimens were found anywhere else or lower down despite careful investigation : this makes the possibility of hilltopping behaviour being involved unlikely to my opinion. The other butterfly species observed at the same spot were the following : *Thymelicus sylvestris* (PODA, 1761), *Erynnis marloyi* (BOISDUVAL, 1834), *Carcharodus orientalis* REVERDIN, 1913, *Papilio machaon* LINNAEUS, 1758, *Gonepteryx cleopatra* (LINNAEUS, 1767), *Aporia crataegi* (LINNAEUS, 1758), *Pieris brassicae* (LINNAEUS, 1758), *Satyrrium ilicis* (ESPER, 1779), *Lycaena phlaeas* (LINNAEUS, 1761), *Aricia agestis* (DENIS & SCHIFFERMÜLLER, 1775), *Polyommatus*

*thersites* (CANTENER, 1834), *Melitaea trivia* (DENIS & SCHIFFERMÜLLER, 1775), *Hipparchia syriaca* (STAUDINGER, 1871), *Hipparchia mersina* (STAUDINGER, 1871), *Pseudochazara anthelea* (HÜBNER, [1824]), *Maniola telmessia* (ZELLER, 1847) and *Lasiommata megera* (LINNAEUS, 1767).

#### F) Geographic history

62 butterfly species (Hesperioidea and Papilionoidea) are presently known to occur on the island of Sámos (ASSELBERGS 1978; GASKIN & LITTLER 1986; OLIVIER 1987 and largely unpublished data to appear in a forthcoming paper by OLIVIER, GARREVOET, VAN DER POORTEN & DILS).

The 61 butterfly species other than *S. ledereri* on Sámos do not seem to have evolved any population here that differs enough from populations on the nearby Turkish mainland to deserve a subspecific name, if different at all. Sámos lies very close to the Turkish coast (less than 2,5 km at its nearest point), moreover it became only isolated from the Turkish mainland earliest during the Flandrian transgression (less than 72.000 years B.P. and maybe only 20.000 years ago - or even less - like many of the Greek islands along the Turkish coast and, for example, Híos (PFANNENSTIEL 1951; DERMITZAKIS & SONDAAR 1979; see also OLIVIER 1988).

Most of the butterfly species on Sámos are widespread and do occur in - or are even restricted to - the lower mediterranean zone (until 500 m above sea level) and many of them have opportunities for (occasional) gene flow with conspecific populations on the adjacent Turkish mainland.

No populations of *S. ledereri* have been recorded so far between Sámos and İrmesan Geçidi (Prov. Antalya, Turkey), both localities lying some 450 km apart. This lack of records between both places could very well be due rather to undercollecting than to real absence of *ledereri* and there are several mountains of more than 1000 m high that could house colonies of *ledereri* lying already in the Turkish province of Aydın, one of these mountains being less than 50 km to the east of Mt. Karvoúni.

*S. ledereri* must have reached Sámos during a westwards expansion from the Taurus Mts.: however, as just stated, we do not know if (relict) populations actually remain in SW. Turkey. It is also not possible to date more or less precisely the time of arrival of *S. ledereri* on Sámos, that was probably still part of the Turkish mainland then. The clear differences in phenotype between *S. ledereri christiana*e as compared to *S. ledereri ledereri* are not necessarily due to a long period of isolation, but can be the result of rapid genetic drift or bottlenecking of the population, whether or not combined with selective environmental pressure. The future discovery of *S. ledereri* in SW. Turkey, beginning with the province of Aydın, in order to look how differentiated those populations - if existing - are from *christiana*e on Sámos, could throw more light on the subject matter.

Obviously the single presently known population of *S. ledereri christiana*e is very vulnerable and the slightest alteration of its biotope (through grazing by goats for example, that do occur all over the Ámbelos Óri), as well as the



fig. 1 - *Satyrium ledereri ledereri* (BOISDUVAL, 1848) ♂, «Ost Armen.» [E. Armenia, U.S.S.R.] 1887, coll. ITZ



fig. 2 - *Satyrium ledereri ledereri* (BOISDUVAL, 1848) ♀, Geyik Dagħ, 30 km NE. of Gündoğmus (Prov. Antalya, Turkey) (2000 m) 23.VII. 1978, leg. B. VAN OORSCHOT, in coll. ITZ



fig. 3 - as fig. 1 (underside)



fig. 4 - as fig. 2 (underside)



fig. 5 - *Satyrium ledereri ledereri* (BOISDUVAL, 1848) ♂, 32-35 km NE. of Gölbaşı (Prov. Malatya, Turkey) (1200-1400 m), si. 217, 30.V.1985, leg. H. VAN OORSCHOT & H. VANDEN BRINK, in coll. ITZ



fig. 6 - *Satyrium ledereri ledereri* (BOISDUVAL, 1848) ♀, Gökpınar, S. Gürün (Prov. Sivas, Turkey) (1500 m) 9.VII.1982, leg. et coll. G. HESSELBARTH



fig. 7 - *Satyrium ledereri christianae* n. ssp. ♂, HOLOTYPE, Mt. Karvoúni (Sámos, Greece) (1150 m) 11.VI.1988, leg. A. OLIVIER, in coll. ITZ

fig. 8 - *Satyrium ledereri christianae* n. ssp. ♀, PARATYPE, Mt. Karvoúni (Sámos, Greece) (1150 m) 13.VI.1988, leg. et coll. A. OLIVIER



fig. 9 - as fig. 7 (underside)

fig. 10 - as fig. 8 (underside)



fig. 11 - *Satyrium ledereri christianae* n. ssp. ♂, PARATYPE, Mt. Karvoúni (Sámos, Greece) (1150 m) 11.VI.1988, leg. et coll. A. OLIVIER

fig. 12 - as fig. 11 (underside)

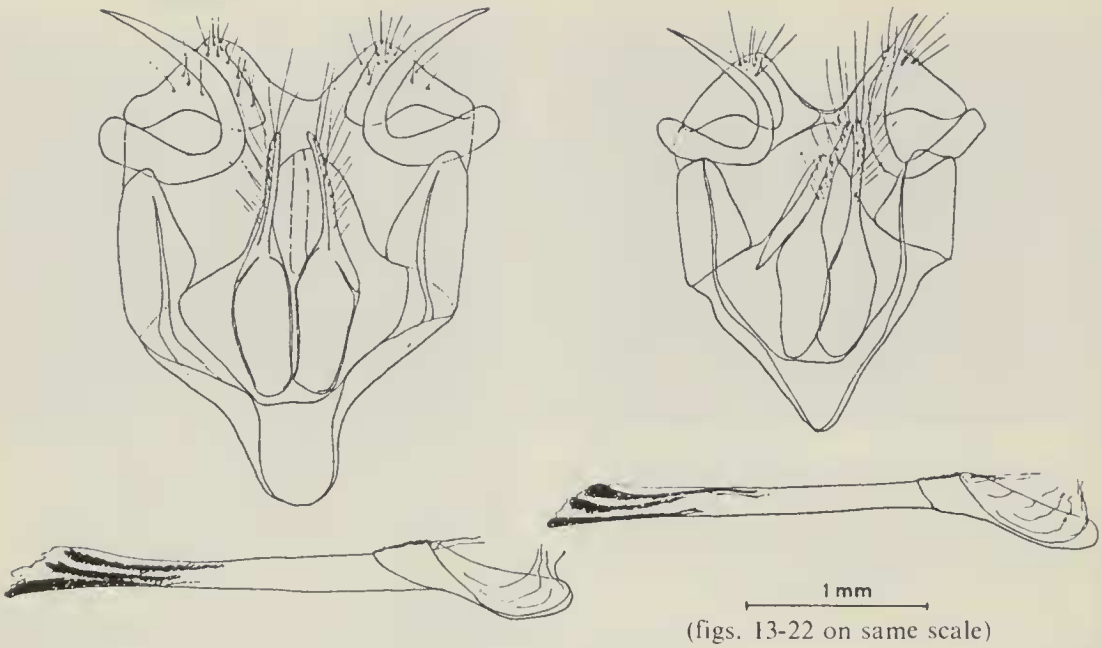


fig. 13 - *Satyrium ledereri ledereri* (BOISDUVAL, 1848) ♂, «Ost. Armen.» [E. Armenia, U.S.S.R.] 1887, coll. ITZ, gen. 2748 [W.O. DE PRINS]

fig. 14 - *Satyrium hyrcanica cyri* (NEKRUTENKO, 1978) ♂, Apsheron CA PAG CHYZY (Caucasus, U.S.S.R.) (500 m) 11.VI.1987, leg. Y.P. NEKRUTENKO, in coll. ITZ, gen. 2756 [W.O. DE PRINS]

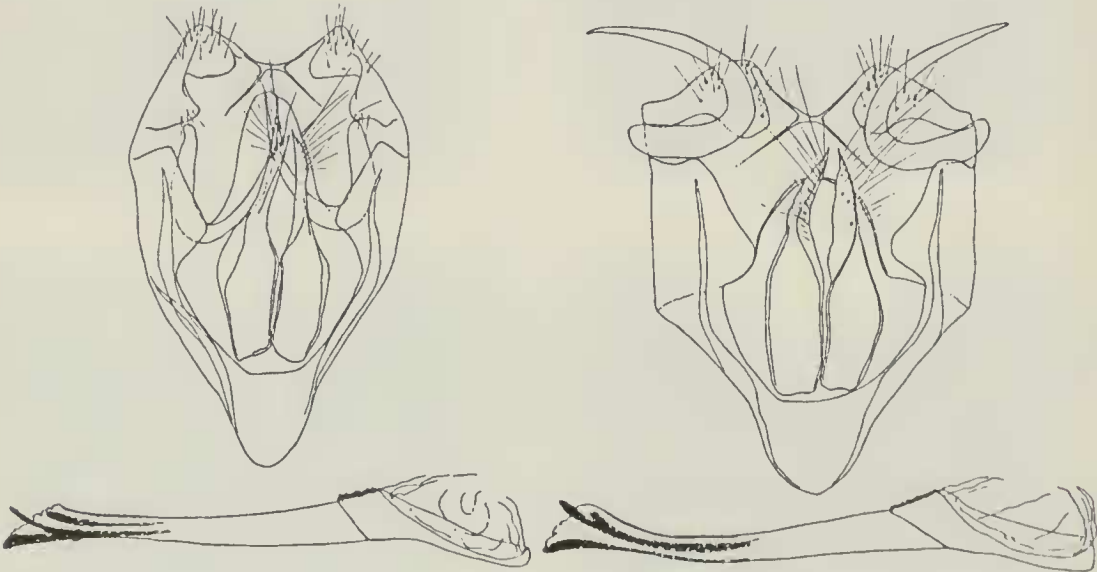


fig. 15 - *Satyrium ledereri ledereri* (BOISDUVAL, 1848) ♂, env. Gökpinar, 10 km S. Gürün (Prov. Sivas, Turkey) (1500-1700 m), st. 91, 15-29.VI.1983, leg. B. VAN OORSCHOT, in coll. ITZ, gen. 2749 [W.O. DE PRINS]

fig. 16 - *Satyrium ledereri ledereri* (BOISDUVAL, 1848) ♂, Irmesan Geçidi, 12 km N Akseki (Prov. Antalya, Turkey) (1500-1900 m) 24-27.VII.1981, leg. H. COINE, J. LUCAS & B. VAN OORSCHOT, in coll. ITZ, gen. 2750 [W.O. DE PRINS]

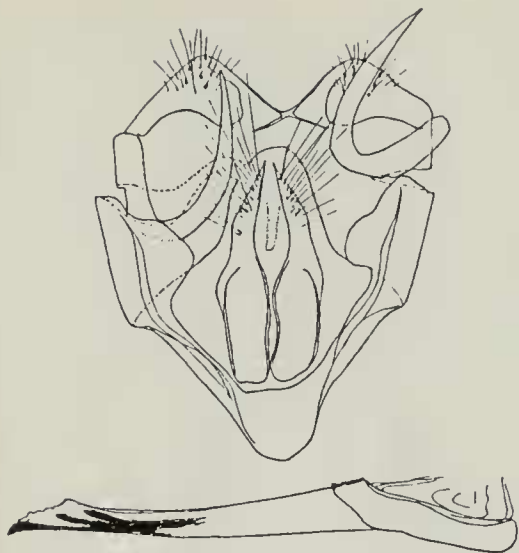


fig. 17 - *Satyrium ledereri christianae* n. ssp. ♂, PARATYPE, Mt. Karvoúni (Sámos, Greece) (1150 m) 11.VI.1988, leg. et coll. A. OLIVIER, gen. 2751 [W.O. DE PRINS]



fig. 18 - *Satyrium ledereri christianae* n. ssp. ♂, PARATYPE, Mt. Karvoúni (Sámos, Greece) (1150 m) 11.VI.1988, leg. et coll. A. OLIVIER, gen. 2752 [W.O. DE PRINS]



fig. 19 - *Satyrium ledereri ledereri* (BOISDUVAL, 1848) ♀, env. Gökpınar, 10 km S. Gürün (Prov. Sivas, Turkey) (1500-1700 m), st. 91, 15-29.VI.1983, leg. B. VAN OORSCHOT, in coll. ITZ, gen. 2753 [W.O. DE PRINS]



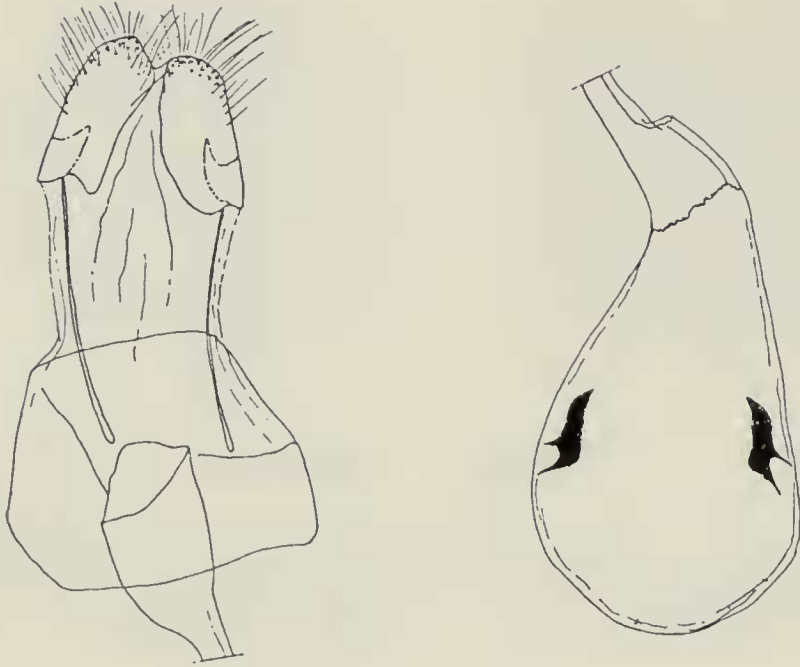


fig. 20 - *Satyrium ledereri ledereri* (BOISDUVAL, 1848) ♀, Gündoğmus (Prov. Antalya, Turkey) 26.VII.1977, leg. B. VAN OORSCHOT, in coll. ITZ, gen. 2754 [W.O. DE PRINS]

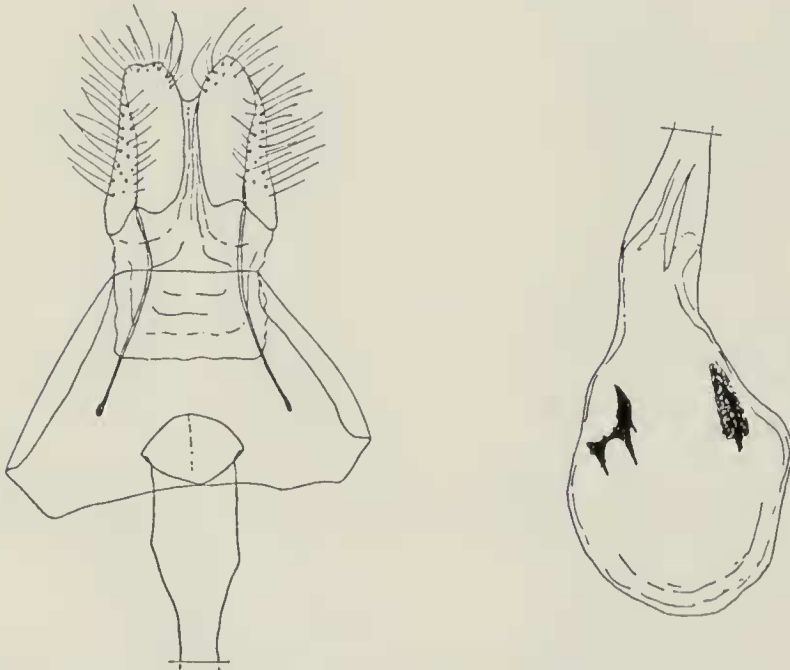


fig. 21 - *Satyrium ledereri christiana* n. ssp. ♀, PARATYPE, Mt. Karvoúni (Sámos, Greece) (1150 m) 11.VI.1988, leg. et coll. A. OLIVIER, gen. 2755 [W.O. DE PRINS]



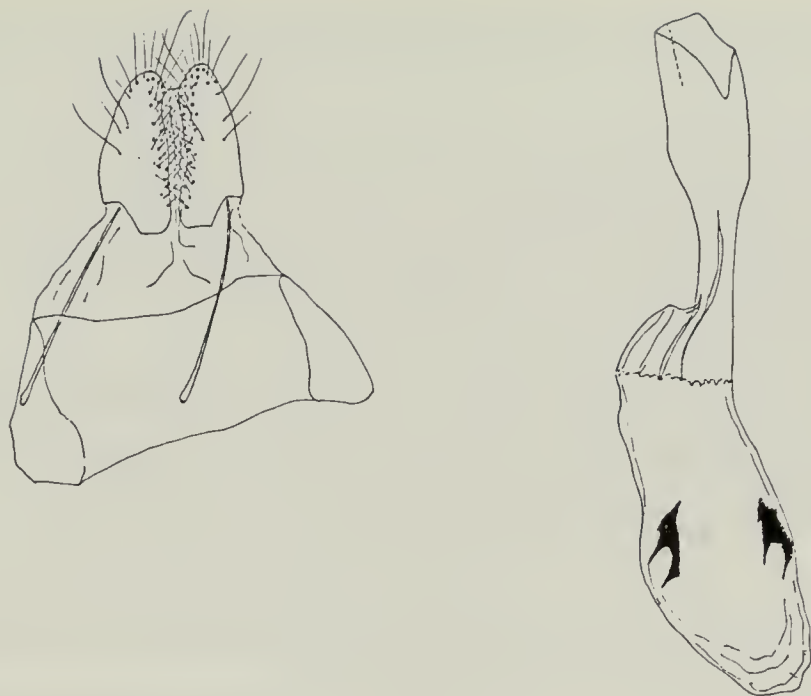


fig. 22 - *Satyrium hyrcanica cyri* (NEKRUTENKO, 1978) ♀, Apsheron CA PAG CHYZY (Caucasus, U.S.S.R.) (500 m) 11.VI.1987, leg. Y.P. NEKRUTENKO, in coll. ITZ, gen. 2757 [W.O. DE PRINS]

excesses of possible collectors without scruples could cause its extinction.

It is to be hoped that any future collector who might find the present, or any other presently unknown, population of this tiny butterfly on Sámos will take his (her) responsibility towards its conservation.

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